

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1944

IN THE financial field the Arnold Arboretum closed the year with a substantial addition to its credit balance, this chiefly because of certain positions that were vacant because of the absence of some employees on duties connected with the war, and the fact that balances remained in specified budgetary items because of the impossibility of acquiring supplies and equipment due to current restrictions because of war conditions. In addition to the regular income of the institution, the Gifts for Cultural Purposes Fund received a total of \$1835.00 in the form of unsolicited gifts from friends of the institution, while the extra-budgetary restricted Publication Fund was increased by \$2858.00, mostly from similar sources; of this amount \$700.00 represents a grant from the Board of the Netherlands Indies for use in publishing an English translation of Dr. Lam's "Fragmenta Papuana." A grant of \$600.00 from the Penrose Fund of the American Philosophical Society, supplemented by a similar amount from the Milton Fund of Harvard University, was received for the use of the Director in connection with the preparation of a comprehensive *Index Rafinesquianus*. Grants totalling \$3400.00 were received from the Milton Fund, the Penrose Fund, the National Academy of Sciences, and the Society of Sigma Xi, to finance a second season's work on the Alaska Military Highway by Dr. Raup and his associates. The only additions to capital were the annual accretions under the terms of gift to the James Arnold and Charles Sprague Sargent funds. The James R. Jewett Prize was awarded in August, but the Vieno T. Johnson prize was deferred.

Staff.—No changes were made in the technical staff, other than the resignation of Dr. Hui-Lin Li at the end of October, 1943. Leave of absence was granted to Dr. C. E. Kobuski, as he still remained in the military service. In the grounds group we are short-handed because several of our employees were drafted for military service, while others resigned to work in war industry plants. In general, as would naturally be expected, the labor situation was critical, and certain types of work had to be deferred or greatly curtailed.

Instruction.—The situation in 1944 approximated that of 1943, but with a further reduction in the number of graduate students. The accelerated instruction program remained unchanged and the limitation of staff members to giving a half-unit course every other year continues to be waived, and will so continue as long as war conditions prevail. The teaching program of staff members continues to be light.

Buildings, grounds, and horticulture.—The usual care has been given to the maintenance of all buildings, but the plantings have suffered,

due in part to a shortage of labor, and in part to the distinctly abnormal weather conditions. The past year was an exceedingly dry one, the rainfall deficiency approximating 12 inches. Because of little rain in November and December, and very little snow cover in the winter months, there was considerable winter injury to the root systems of small shrubs. While from the standpoint of temperature the winter was mild, zero temperatures being experienced but once, injury to various trees was manifest, probably because of the unusual winter dryness of the soil. The unseasonable late frosts of May 17 to 19 did some damage, killing flower buds and even the young leaves of some plants.

Because of the very dry weather the fire hazard in the Arboretum was unusually pronounced during the fall and spring months, about 75 fires occurring within the limits of the Arboretum. This was a decided increase over other years. While most of these were of minor importance, in two cases considerable damage was caused, chiefly among the Chinese spruces on South Street hill and among the dwarf conifers adjacent to the horseback trail. Regardless of the precautions taken during the spring and fall months in posting wardens, fires will occur, and unfortunately some do considerable damage. It is hoped that during the fall and winter months of the coming year some fire lanes can be established to prevent further damage in certain sections.

During the past year 179 species and varieties of woody plants were planted in the collections, many of these representing species not previously grown on the grounds. A total of 600 living plants, 18 lots of cuttings, and 22 packets of seeds were received. In the same period 1150 living plants, 65 lots of cuttings, and 16 packages of seeds were distributed.

It having been repeatedly demonstrated that certain varieties of Ghent azaleas are hardy under New England conditions, some 80 plants representing 40 different varieties were acquired and established on the Case Estate in Weston, and seedlings of 20 additional forms are being grown in the propagating house. While many of the desirable forms have long been grown in the Arboretum collections, many of the better varieties are rare or unavailable in the nursery trade, and it has seemed to us highly desirable to attempt to increase the supply. The favorable conditions at Weston have enabled us to initiate work on this task, and once the plantings are well established it is our plan to propagate the better varieties and to attempt to develop new ones by selection and hybridization. Furthermore, at Weston a collection of our new hybrid crab apples and ornamental cherries has been established by transfer of selected stock from the Arboretum nursery.

The Arnold Arboretum is very widely and favorably known for its extensive living collections of hardy ligneous plants. The original objective was to grow as many different forms as possible that are hardy under our climatic conditions. It now seems to be highly desirable to select the more outstanding horticultural forms. It is believed that the institution is now in a position to make an important contribution to American horticulture by

undertaking comparative studies in such groups as the lilacs, mock oranges, weigelas, roses, and others important in horticulture. The objective here would be to determine and to list the more outstanding forms or varieties from the large number of available ones and contrast these with the larger number which have proved to be of secondary importance. Such tasks take considerable time, but by concentrating on group after group, it will be possible to consider the various genera within a reasonable length of time. As an example, there are 108 *Philadelphus* plants in our collections with different names. A careful study of this group shows that only 35 of them can be considered as worthy ornamentals, although a very much larger number of named forms are offered in the trade. As studies of individual groups are completed, our findings can be passed on to both the amateur and the professional plantsmen, and thus we can increase the service of the institution to American horticulture.

Like all institutions of its type, the Arboretum has suffered from a shortage of labor. It has been necessary to curtail certain seasonal operations and to postpone other projects that involved much labor. The results are evident to the observer, but an improvement can scarcely be expected until conditions become more normal. One great need is a trained and experienced pruner, as many of the older trees on the grounds need attention and intelligent care. On the whole, in spite of the adverse labor conditions, much of the normal seasonal work has been accomplished.

In connection with the war effort the number of Victory gardens was considerably increased, as the use of the South Street nursery site, which was reconditioned last year, was granted to the Boston Victory Garden Committee, and all of the available space was utilized under the supervision of city authorities.

That the Arnold Arboretum strongly appeals to the general public is attested by the continued very large number of visitors, particularly at the height of the flowering season in May and early June. It is estimated that in spite of transportation restrictions there were at least 50,000 pedestrians in the grounds on lilac Sunday (May 21), and on the preceding Sunday approximately 35,000.

The War Effort.—Staff members have continued to render services important in one way or another to the prosecution of the war. The work of the Harvard Camouflage Committee, on which staff members of the Arnold Arboretum served, was concluded. The practicable and easily applied principles in reference to the selection of plant material for use in camouflage work were made available to the use of camoufleur schools in the form of two reports, the findings proving to be of distinct value. As one result of the publication and wide distribution of Technical Manual 10-420, "Emergency Food Plants and Poisonous Plants of the Islands of the Pacific," many inquiries have been received from service men operating in the Orient, scattered from Assam and Upper Burma to New Caledonia. Collections of botanical material are being received from the southwestern

Pacific, and so far it has been possible to report on each lot within a day after specimens were received. During the year the preliminary lists of species were prepared for a projected publication by the Navy Department on native woods for construction purposes in the western Pacific region, which was compiled in Washington. All of the illustrations were prepared at the Arnold Arboretum by an artist sent to Boston by the Navy Department, as the only comprehensive collections of specimens from the region covered in any United States botanical institution is in our herbarium. Our files of photographs, representing scenery in New Guinea, the Solomon Islands, China, Japan, Formosa, and other active and potentially active areas have been made available to representatives of the War and Navy Departments. Much assistance has been rendered to searchers for information, calling attention to maps, illustrations, topographical, climatological, and other data incorporated in technical botanical papers appertaining to Japan, the Bonin Islands, Formosa, the Philippines, the Netherlands East Indies, Papuasia, Micronesia, and Polynesia. The extensive bibliographic researches, carried out in the past, on the botanical publications appertaining to eastern Asia and the Pacific basin enabled us promptly to locate much needed information regarding specific areas. I have continued to lecture at the Army Medical School in Washington to each incoming group of trainees in the two months intensive refresher courses on tropical medicine.

During the year I prepared a chapter on plant life for "The Pacific World," edited by Fairfield Osborn, President of the New York Zoological Society. The volume was published in June, 1944, and a very large special edition is to be issued for distribution to service men throughout the Orient. The objective was a popular work on various phases of natural history, and about 30 individuals coöperated in supplying the data. The idea behind the preparation and publication of the volume was to give service men, particularly those who would have to remain in relatively quiet areas on garrison duty, some knowledge of their surroundings, indicating how they might utilize their spare time in developing interest in this or that phase of natural history. Now a series of volumes is projected on such subjects as animals, birds, insects, fishes, shells, plants, etc., each volume to be the work of an authority in each field. I undertook the preparation of the copy and illustrations for the projected "Plant Life of the Pacific World," and this is now nearly completed.

Botanical Survey of the Alaska Highway. — This project was mentioned in the last annual report. The field work in the summer of 1943 was eminently successful, and some of the results were of such a practical nature and of such special interest to the military engineers that it was suggested that the campaign be continued over a second season. In the summer of 1943 only a part of the road could be covered, the party going as far north as Whitehorse. The authorities wished to have that part of the road from Whitehorse to Fairbanks covered in a manner corresponding to the stretch from Edmonton to Whitehorse. The same privileges were granted for 1944

as attained for 1943, namely free transportation on the road and commissary privileges. Accordingly, Dr. Raup planned a field trip to northern Canada to cover the summer season of 1944, with the coöperation of the military authorities. This year the party consists of Dr. H. M. Raup of the Arboretum staff, with Mrs. Raup and their two sons, Dr. S. K. Harris of Boston University, these being the botanical members of the expedition, Mr. John H. H. Sticht, glacial geologist, and Mr. Frederick Johnson, archeologist. The party left Boston at the end of May, 1944, and will return about the middle of September. This year the botanical aspects of the expedition were financed by a second grant of \$1500.00 from the Milton Fund of Harvard University, \$1000.00 from the Penrose Fund of the American Philosophical Society, \$500.00 from the Joseph Henry Fund of the National Academy of Sciences, and \$400.00 from the Society of Sigma Xi. The expenses of Mr. Sticht are covered by a \$900.00 grant from the American Geological Society, and those of Mr. Johnson by a grant of \$1000.00 from the Peabody Foundation, Andover Academy. Details regarding field operations will not be available until next year, and this does not appear to be the time to discuss the practical results of the first season's operations, because of the nature of the case. Among the botanical results of the 1943 campaign was the preparation of approximately 15,000 botanical specimens, and it is anticipated that the collections to be made in 1944 will equal or exceed those secured last summer. The combined collections of the two season's campaign will be studied and reported upon as a unit when the determinations are completed. The extensive series of duplicates will be distributed to the larger botanical institutions of the United States, Canada, and Europe, as a part of our general exchanges. The construction of the emergency Alaska Military Highway made accessible a vast stretch of territory not previously explored from a botanical standpoint, and it was most fortunate that we had on our staff a widely experienced taxonomist and ecologist thoroughly familiar with northern Canada from his eight previous expeditions, who could take the lead, organize the two expeditions, and thus be the first botanist to visit the region traversed by this long highway that extends through the wilderness for a distance of 1500 miles. The 1944 trip is Dr. Raup's tenth botanical expedition into northern and western Canada.

Plant breeding. — The breeding work has resulted in a number of ornamental shrubs which have been selected for propagation and further tests. Among these is a semi-dwarf flowering cherry of the *subhirtella* type which blooms over a long period, a dwarf form of *Forsythia*, and a very compact globular form of *Malus*. Six of the better types of hybrid flowering crab apples have been propagated. Several of these have large purple flowers and attractive red fruits. Two spreading white-flowered segregates also have been selected for further tests. A few hybrids between American and Asiatic species of *Malus* have been obtained, but these have not yet flowered.

Breeding and cytological work with the Persian lilacs and their hybrids

has cleared up the taxonomic status of this group of lilacs and is of horticultural interest. As Mrs. McKelvey has suggested, *Syringa persica* and most of its varieties are of hybrid origin and are allied with *S. chinensis*, which is recognized as a hybrid between *S. vulgaris* and a Persian lilac. The only fertile true breeding Persian lilac is *S. persica laciniata*. This lilac crosses freely with *S. vulgaris* and with *S. pinnatifolia*. The first cross produces generally weak progeny, but the second cross produces hybrids of great vigor.

The artificially induced tetraploids of *Forsythia* and *Philadelphus* continue to show considerable promise. The tetraploid *Forsythia* is very hardy and has very large deep yellow flowers. Both tetraploids have been crossed with diploids to obtain sterile triploid forms.

Much of the breeding work at present involves wide species crosses which usually do not produce mature seed. If, however, the young embryos are cultured in nutrient agar, some of the crosses can be made to produce progeny. The culture technique has been part of our breeding program for the past five years. This work is now being done by Dr. Hally J. Sax.

Wood Anatomy. — Professor Bailey and Dr. Nast have continued their coöperative investigations of woody ranalian families with Dr. Smith. The last of seven papers dealing with the comparative morphology of the Winteraceae is now complete. A series of investigations dealing with the morphology and relationships of the much discussed ranalian genera *Trochodendron*, *Tetracentron*, *Illicium*, *Euptelea*, and *Cercidiphyllum* is nearing completion. Dr. Genevieve Dawson and Miss Lillian L. Nagel are studying the comparative morphology of the Escalloniaceae and Monimiaceae.

The Herbarium. — During the year 17,345 specimens were mounted — a number smaller than the annual average, due to the fact that inter-institutional exchanges have decreased because of the war, while our residue of unmounted old collections has been essentially eliminated. Of this number, 9,212 were inserted into the herbarium, which now includes a total of 617,944 specimens.

Because of the slackening of pressure upon our mounting staff, an arrangement was made with the Gray Herbarium whereby some of their accumulated Old World material was mounted at the Arboretum. Of the sheets mounted under this arrangement, 2,280 were returned to the Gray Herbarium, while 3,164 were retained at the Arboretum and accessioned as a transfer. Sections of the Arboretum herbarium were systematically examined by the mounters and desirable repairs were made.

A total of 26,822 specimens was received from other institutions or from individuals, by exchange, gift, subsidy, purchase, or for identification. As might be expected, the greater part of these came from North and South America. Important acquisitions include the 3,164 specimens mentioned above as transferred from the Gray Herbarium (among which are important

collections from the Belgian Congo, the Philippines, and Borneo), 2,518 Mexican specimens collected by G. B. Hinton, received from the New York Botanical Garden (subsequently transferred to the Gray Herbarium for selection of numbers lacking in the Hinton series at that institution), and 2,130 miscellaneous plants from the U. S. Department of Agriculture (including 870 specimens from the Canton region of China collected by E. D. Merrill but not previously distributed). Periodical shipments of Australian specimens continue to be received from Mr. C. T. White of the Brisbane Botanic Gardens, and Mr. William Greenwood continues his collecting for the Arboretum in Fiji. The largest and most important accession during the year, however, was the item of about 15,000 specimens of Canadian plants collected by Dr. Raup and his party along the Alaska Highway, as discussed in detail in a preceding paragraph.

The Arboretum distributed 11,745 specimens to other American institutions. Of these, 6,715 were sent in exchange and 4,378 were transferred to the Gray Herbarium, the remainder having been sent either as gifts or for identification by specialists. To the Gray Herbarium and the Ames Orchid Herbarium at the Botanical Museum were sent 412 illustrations for incorporation into the herbaria. Microfilm was distributed, under a special exchange arrangement, to the equivalent value of 177 specimens. The total number of specimens or their equivalent in mounted illustrations and microfilm distributed by the Arboretum was, therefore, 12,334. This number does not compare favorably with the usual annual figure, partly because of wartime restrictions on shipping.

Specialists and students in 13 American institutions called on the Arboretum for 21 loans, totalling 1,066 specimens. For the use of members of our own staff, 50 loans with a total of 1,758 specimens were received from 14 institutions.

To the catalogue of references to new species and other important literature dealing with woody plants, 3,266 cards were added; this catalogue, which is constantly consulted not only by our own staff members but also by visitors from other institutions, now contains 136,998 cards. No negatives were added to the collection representing types and other critical species during the year, the total number of such negatives remaining at 4,211.

As in recent years, routine herbarium work has been limited to the incorporation of clippings, typed descriptions, and illustrations, only a comparatively few specimens being added to the general collections because of the critical space situation. Mounted specimens are stored in family and generic order in cardboard boxes—an arrangement which must be continued until additional storage space in the herbarium is available. Although far from satisfactory, this arrangement permits staff members to consult newly mounted specimens with reasonable efficiency.

In addition to the usual number of routine identifications and reports, members of the herbarium staff continued studies in their special fields. Professor Rehder devoted a large part of his time to his Bibliography of

Cultivated Trees and Shrubs; for the purpose of checking various entities he visited libraries in New York, Philadelphia, and Washington. Dr. Smith continued his studies of tropical plants, completing a summary of the Elaeocarpaceae of New Guinea and working on various ranalian families in collaboration with Professor Bailey and Dr. Nast. Dr. Johnston devoted most of his time to a study of his very extensive collections from the plateau region of north central Mexico and adjacent parts of Texas. Four parts of his comprehensive catalogue were published during the year, and the manuscript on the families from the Caryophyllaceae to the Rosaceae is in an advanced state of preparation. Dr. Raup nearly completed his report on the extensive collections made by him in the Mackenzie Mountains, Alberta Province, in 1939, and has continued his work on mapping the ranges of species in Canada. Much time was of necessity devoted to the completion of plans for his 1944 trip along the Alaska Military Highway above noted. Mr. Palmer, continuing his studies of special groups in North America, devoted special attention to the genus *Crataegus* in the northeastern states. Dr. Allen, in connection with her work on the American Lauraceae, prepared revisions of certain Central American groups. Dr. Perry, in addition to continuing her studies of the New Guinean material of the Richard Archbold Expeditions, prepared a translation from the Dutch of Professor H. J. Lam's important "Fragmenta Papuana"; this translation will be published in a forthcoming number of *Sargentia*. Dr. Croizat devoted most of his time to a study of various groups of the Euphorbiaceae. Dr. Li left his position at the Arboretum in October to undertake work at the Philadelphia Academy of Sciences, having been the fortunate recipient of a Harrison Graduate Fellowship at the University of Pennsylvania. Previous to this he completed his study of several families of our large Chinese and Indo-Chinese collections. His project at Philadelphia will be an intensive study of the very large and complex genus *Pedicularis* as represented in China. My own work has been largely confined to checking the very extensive Index Rafinesquianus, reporting on current collections from the southwestern Pacific area, supplying information of various types to representatives of the armed forces, and the preparation of the manuscript for a projected semi-popular volume on the plant life of the Pacific region. Some work has been done in association with Dr. Perry on our accumulated collections of Papuasian plants, and certain assistance was rendered to Dr. Perry in connection with her translation of Dr. Lam's "Fragmenta Papuana" from the original Dutch version.

Linnaean microfilms. — This accession was discussed in the last annual report. Those films covering the Linnaean publications and manuscripts have been arranged so that they are now available for consultation. The task of preparing enlarged prints from the exposures representing herbarium specimens has been completed, there being approximately 16,000 of these prints. Their arrangement for purposes of consultation depends upon the completion of the new catalogue of the herbarium, the manuscript of

this being under preparation in London. A second set of prints is now being prepared for exchange purposes.

Bibliography. — Dr. Verdoorn has continued his work on the master file of the projected *Index Botanicorum*, and a booklet describing the aims and the scope of the project is in preparation. This is especially intended to supply basic information for foreign collaborators. Many references, including the names listed in the older botanical literature, were added during the year. He also completed and edited the extensive "Plants and Plant Science in Latin America" and "Science and Scientists in the Netherlands Indies." In the preparation of the data included in these two volumes, he had the coöperation of 170 individuals. He also edited volumes 12, 13, and 14 of his new series of plant science books, and has continued to be responsible for the central depository library for the Netherlands Indies in New York. Volume eight of his *Chronica Botanica* is dedicated to Charles Sprague Sargent, first Director of the Arnold Arboretum, whose unswerving interest over a period of 54 years resulted in the institution as we know it today. One of Dr. Sargent's prime interests was the library, which he consistently enriched, and which Dr. Verdoorn has found to be a veritable mine of information for the basic data needed in connection with the extensive *Index Botanicorum* project. The dedication is: "Arborum librorumque amatori Carolo Sprague Sargentio in arboreto arnoldiano bibliothecaque locupletissima pia anima pervigilanti hic chronicorum botanicorum tomus octavus dedicatur."

The Library. — Accessions to the library during the past fiscal year amounted to 250 bound volumes and 140 pamphlets, making the total number of bound volumes 45,563, and of pamphlets 13,462. Approximately 595 cards were added to the main catalogue, 250 of them containing bibliographical data, and some 622 slips were added to the files which supplement the printed author and subject catalogue of the library. Inter-library loans continued to be very numerous, and many orders for photostats and microfilms were received. Most of our forestry periodicals, numbering about 3,600 volumes, were deposited in the library of the Harvard Forest in Petersham. Our large collection of photographs was carefully checked through by the Navy Department, and many were sent on loan to Washington to be reproduced.

Atkins Institution of the Arnold Arboretum. — The limitations mentioned last year still prevail in reference to this unit, so that about all that could be done was to maintain and extend the plantings at Soledad. Difficulties have been encountered because of the impossibility of securing certain supplies and because of the extremely dry weather that characterized the past year, as well as the preceding one, and because of the necessity of increasing wages. The small stream which supplied water for irrigation purposes failed in two successive years at the height of the dry season, but

spring sites were known to be present in the cane fields assigned to the use of the garden in 1939, and three wells developed on these sites have provided sufficient water for present needs. It became necessary, however, to rearrange certain pipe lines and pumping installations. Additional plantings have been made in the palm section. During the year 195 living plants and 346 packages of seeds were distributed, and 20 living plants and 176 packages of seeds were received from abroad.

Publications. — Four numbers of the Journal appeared as usual, and a fourth number of *Sargentia*, including papers by Dr. A. E. Porsild (National Herbarium of Canada, Ottawa) on the flora of the continental Northwest Territories of Canada and by Dr. Raup on the willows of the Hudson Bay region and the Labrador Peninsula, was published. A fifth number of *Sargentia*, containing Dr. Perry's translation from the Dutch of Professor Lam's "Fragmenta Papuana," is now in press. *Arnoldia* was issued as usual. A bibliography of the published papers by staff members and students follows.

Bibliography of the Published Writings of the Staff and Students July 1, 1943 — June 30, 1944

- ALLEN, C. K. *Nectandra coriacea*. *Addisonia* **22**: 9-10, 12, *pl.* 1943.
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 ——— Insecticides and their importance for the home front. *Rossiya* **11**(2713): 3, 6. 1943 (In Russian).
 ——— More about kok-sagyz. *Rossiya* **11**(2752): 4. 1943 (In Russian).
 ——— Princess Ekaterina Romanovna Dashkova, 1744-1810. *Rossiya* **12**(2912): 3-4. 1944 (In Russian).
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 ——— & NAST, C. G. The comparative morphology of the Winteraceae, I. Pollen and stamens. *Jour. Arnold Arb.* **24**: 340-346, 3 *pl.* 1943.
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 ——— *Amanoa potamophila*, *Euphorbia Lundelliana*, and *Sapium Schippii*. *Am. Midland Nat.* **29**: 475-477. 1943.
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